REMARKS

35 USC §103(a)

Claims 6, 14-15, 18 and 20-25 stand rejected under 35 USC 103 (a) as unpatentable over Cresson et al., (5,129,298) in view of Van Devanter et al. (4,557,019) or Rudy et al. (4,875,254).

As acknowledged in the Office Action, providing lamps in a longitudinal tunnel for increasing contrast in order to detect cutting faces is not disclosed by the Cresson patent. In this reference, the cutting face is silhouetted only from behind the face, without a tunnel being provided. The Rudy and Van Devanter references disclose lamps in vertical "shrouds" for illuminating an uncut body.

In contrast to the Rudy and Van Devanter references, the lamps provided in the present invention are provided along the longitudinal axis and in a tunnel, so that the tunnel increases the effective contrast at the cut face. This novel and consequential feature is structurally recited in claim 6 with the phrase "the tunnel having a length substantially aligned with the longitudinal direction."

The camera in the Van Devanter reference is located above the products and detects the top, uncut surface of a fish fillet. In Van Devanter, the form of the product is measured only from the top, and a corresponding volume and weight is calculated based upon the contour. Therefore, the fish-fillet is guided under a vertical "shroud" (32, see Fig. 1, Col. 2, line 61) and illuminated from the top. Thus Van Devanter teaches away from a longitudinal tunnel because it would hinder the view from above.

The camera and lights in Van Devanter are on the same side of a product surface to be imaged by reflected light. The patent does not deal in any way with measuring the front cutting face of an object.

The camera of the present invention is located in front of the cutting face area, as recited in the claims, opposite the lights, and detects the actual cutting face by its contrast with direct, unreflected light, so that its area may be determined.

In Van Devanter, the step of measuring must be carried out only before cutting. In the present invention, measurement may be carried out during the cutting process, because the actual cutting faces may be evaluated because of the recited locations of the camera and lights.

With the method according to Van Devanter, there is no way to detect hollow portions of the object between top surface and conveyor belt. This causes inaccurate calculations of cut face area. This shortcoming of the prior art is overcome by the novel structure of the present claims.

Regarding U.S. Patent 4,875,254 disclosing a slicer comprising a camera 72 for monitoring a product to be sliced, another vertical "tunnel" is defined by wall 76, which tunnel is illuminated by a lamp 82 from the top. The lamps are mounted crosswise to the direction of conveying (see figure 1). In the present invention, the lamps are mounted along the longitudinal axis in the tunnel, resulting in increased contrast by use of the tunnel.

Further, in U.S. Patent 4,875,254 the outline of the face of the source body to be sliced is not illuminated during the slicing process. Further, the conveyor's underside is only assumed to be the bottom border. It is assumed in US Patent 4,875,254, that over the thickness of the slice the product outline is nearly constant. Assuming the conveyor as bottom border of the product might be allowed for products like unfrozen fish fillets that adapt themselves to the surface of the conveyor. In the case of frozen products, however, hollow portions between the product and the conveyor can falsify the measurement result. The method of the US Patent 4,875,254 is therefore not useful for slicing of naturally formed products like ham and other meat having a shapeless outline and an unstraight body.

Further, the method disclosed in U.S. Patent 4,875,254 has a first step of measuring the surface and a second step of calculating the slice thickness. The slice surfaces are of no interest and the exact cross-section of the surface to be sliced is not calculated online in the process of slicing.

Thus, no plurality of lamps for illuminating the surrounding area or "environment" of the cutting face from a longitudinal tunnel is provided in the combined prior art reference. Further, in the prior references there is no suggestion or motivation of illumination around the contour of the cutting face as disclosed, but only illuminating and scanning of the top product surface. Thus, the inventive step of using a tunnel together with lamps along the longitudinal axis in the tunnel for increasing the contrast between cutting face and surrounding area for a camera opposing the lamps, as structurally recited in the claims, is not suggested in the references.

Moreover, Cresson itself teaches away from the pending claims. Cresson uses another optical method, namely projection of a pattern comprising line bars to determine the surface area. The essential feature is that the positions of the pattern elements in the picture allow a calculation of the area. The distance of the lines corresponds to the distance of the measurement points. It is essential in Cresson that the elements of the pattern in the picture can be distinguished and assigned to defined points.

The method according to the present invention requires a complete illumination of the surface and background illumination of the contour of the cutting face area. No assignment of light pattern is required. The method of the present invention evaluates the grey values from dark in between the cross-section area and brightness of the product area and the background, which is self-illuminating as seen from the camera. In U.S. Patent 4, 557,019, a simultaneous detection of structure in the cutting face is not disclosed or even possible.

In the present invention, the actual cross-section of the surface to be sliced is measured in the slice process just before a following cut. The actual cross section area is used for controlling the thickness of the following slice. The cross-section area of the following slice is measured accurately because of the hollow portions occurring with many naturally formed products are detected. Therefore, in the present dependent claims (e.g. 15 – 17) a combination of direct illumination of the surface and background illumination of the hollow portions is recited. Because of the view angle of the camera, the slice surface is directed to the camera.

At the same time the camera is viewing the cut surface the background (conveyor surface for holding the product and side stop for the product) are within its field of view. The illumination of the surface is used for providing a visible transition form the cut surface and the product surface. For providing a visible transition between cut surface and background self-lighting background elements are provided.

Conclusion

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

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